47. (New) A cathode composition comprising vanadium oxide particles having an average diameter from about 5 nm to about 500 nm and a binder.

48. (New) The cathode composition of claim 47 wherein the collection of vanadium oxide particles has an average particle size of no more than about 400 nm.

49. (New) The cathode composition of claim 47 wherein the collection of vanadium oxide particles has an average particle size of no more than about 300 nm.

50. (New) The cathode composition of claim 47 wherein the collection of vanadium oxide particles has an average particle size of no more than about 200 nm.

51. (New) The cathode composition of claim 47 further comprising supplementary electrically conductive particles.

52. (New) The cathode composition of claim 47 wherein the binder comprises polyvinylidene fluoride, polyethylene oxide, polyethylene, polypropylene, polytetrafluoroethylene, polyacrylates or mixtures or copolymers thereof.

REMARKS

Claims 1, 4-11, 13-28 and 30-52 are pending. Claim 29 is canceled without prejudice. By this Amendment, claims 1, 8, 15 and 20 are amended, and new claims 30-52 are added. The amendment of claims 1, 8 and 20 is supported by the specification, for example, at page 16, lines 3-13. The amendment of claim 15 is supported by the specification, for example, at page 22, lines 26-29. Applicants assert that the amendment of claim 15 is not intended to

narrow the claim scope in any way since the discharge conditions are inherent in the specification with respect to the evaluation of the energy density. New claims 30-41, 43-46 and 48-50 are supported by the specification, for example, at page 15, lines 8-12. New claim 42 is supported by the specification, for example, at page 16, lines 3-13. New claim 47 is supported by the specification, for example, at page 2, lines 4-6 and page 15, lines 8-12. New claim 51 is supported by the specification, for example, at page 18, lines 23-29. New claim 52 is supported by the specification, for example, at page 19, lines 15-19. No new matter is introduced by the amendments or by the new claims.

Applicants thank the Examiner for the courtesy extended to their undersigned representative in a phone interview on July 24, 2002. Applicants discussed all of the pending rejections. With respect to the rejections under section 112, it was noted that the energy density performance could be considered a value obtainable by optimizing discharge parameters, such as current and the like. Under this view, no elements are missing. Applicants believe that agreement was reached on this point. Applicants have further clarified the claim by introducing inherent features explicitly into the claim. With respect to the rejections over the cited references, several possible approaches for distinguishing the prior art were discussed. The Examiner indicated that the uniformity of the particles was a suitable approach for distinguishing the cited references.

Rejections Under 35 U.S.C. § 112, Second Paragraph

The Examiner rejected claims 15-19 under 35 U.S.C. § 112, second paragraph as being incomplete. In particular, the Examiner has asserted that the claims have omitted elements relating to conditions under which the cathode exhibits an energy density greater than about 900 Wh/kg. Applicants assert that there are no omitted elements as clarified below and in the earlier phone conference. Applicants have added the temperature to the claim, although Applicants

assert that this was inherent in the claim as filed. Applicants respectfully request reconsideration of the rejection based on the claims being incomplete.

The energy density, as claimed, is an inherent property of the material. Applicants have amended the claim to introduce explicitly from the specification the inherent discharge conditions for evaluating the energy density. The discharge conditions generally, such as current and the like, can be adjusted to determine an optimal energy density. Specifically, a person of ordinary skill in the art will recognize how to test a material to determine if the cathode material can achieve the limit in the claimed energy density. Therefore, the claims do not lack any essential elements. Based on the above comments, Applicants respectfully request withdrawal of the rejection of claims 1, 4-11 and 13-29 under 35 U.S.C. § 112, second paragraph as being incomplete.

Rejections Over Koksbang

The Examiner rejected claims 1, 4-6, 8, 9, 13, 14 and 20-27 under 35 U.S.C. §§ 102(a) and 102(e) as being anticipated by U.S. Patent 5,549,880 to Koksbang (the Koksbang patent). The Examiner asserted that the Koksbang patent discloses vanadium oxide particles with diameters from 100 to 5000 nm. While Applicants maintain that the Examiner has not established prima facie anticipation, Applicants have amended independent claims 1, 8 and 20 to advance prosecution of the case. Applicants respectfully request reconsideration of the rejections based on the following comments.

Applicants maintain that the Koksbang patent does not disclose vanadium oxide particles with an average diameter less than one micron (1000 nm). However, to advance prosecution of the case, Applicants have amended the claims to indicate that the vanadium oxide particles have the recited particle size distribution. The Koksbang patent does not teach or suggest vanadium oxide particles with the recited particle size distribution or how to effect

particle size distributions. Therefore, the Koksbang patent clearly does not prima facie anticipate the present claims. Applicants respectfully request withdrawal of the rejection of claims 1, 4-6, 8, 9, 13, 14 and 20-27 under 35 U.S.C. §§ 102(a) and 102(e) as being anticipated by the Koksbang patent.

With respect to new claims 47-52, Applicants note that the Koksbang patent does not disclose an **average** particle size within the claimed range. In principle, unless explicitly provided, the average particles size can only be evaluated based on the particle size distribution. However, the Examiner acknowledges that the Koksbang patent does not disclose a particle size distribution. Therefore, Applicants assert that the Koksbang patent does not render the claims prima facie anticipated. Applicants respectfully request clarification of the Examiner's position regarding the Koksbang patent with respect to average particle size in view of the lack of explicit description of average particle size or particle size distribution.

Rejections Over Olsen

The Examiner rejected claims 1, 4-11, 13, 14 and 20-28 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 5, 443, 809 to Olsen (the Olsen patent). The Examiner asserted that the Olsen patent discloses vanadium oxide particles with a particle size from 0.1 microns to 100 microns. The Examiner further asserts that it would be obvious to use the "electrode-quality" metal oxides in a lithium secondary battery. While Applicants maintain that the Examiner has failed to establish prima facie obviousness, Applicants have amended independent claims 1, 8 and 20 to indicate the recited particle size distribution to advance prosecution of the application. Applicants respectfully request reconsideration of the rejections over the Olsen patent based on the following comments.

Applicants maintain that the Olsen patent does not teach or suggest vanadium oxide particles with average diameters within the claimed size range. However, to advance

prosecution, Applicants have amended claims 1, 8 and 20 to include a feature relating to the recited particle size distribution. The Olsen patent does not teach or suggest vanadium oxide particles with the recited particle size distribution. Therefore, the Olsen patent does not render Applicants' claims prima facie obvious. Thus, Applicants respectfully request withdrawal of the rejection of claims 1, 4-11, 13, 14 and 20-28 under 35 U.S.C. § 103(a) as being unpatentable over the Olsen patent.

With respect to new claims 47-52, Applicants note that the Olsen patent does not disclose an average particle size within the claimed range. In principle, unless explicitly provided, the average particles size can only be evaluated based on the particle size distribution. However, the Examiner acknowledges that the Olsen patent does not disclose a particle size distribution. Therefore, Applicants assert that the Olsen patent does not render the claims prima facie obvious. Applicants respectfully request clarification of the Examiner's position regarding the Olsen patent with respect to average particle size in view of the lack of explicit description of average particle size or particle size distribution.

CONCLUSIONS

In view of the foregoing, it is submitted that this application is in condition for allowance. Favorable consideration and prompt allowance of the application are respectfully requested.

The Examiner is invited to telephone the undersigned if the Examiner believes it would be useful to advance prosecution.

Respectfully submitted,

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Application No. 09/606,884

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August 22, 2002
Date

Shari R. Thorndike

Application No. 09/606,884

ATTACHMENT
MARKED-UP AMENDMENT

Claims As Amended

Claim 29 has been canceled.

Claims 1, 8, 15 and 20 have been amended as follows:

1. (Twice Amended) A cathode composition comprising vanadium oxide particles having an average diameter from about 5 nm to about [500] 1000 nm and a binder, wherein the collection of vanadium oxide particles has a distribution in sizes such that at least about 95 percent of the particles have a diameter greater than about 40 percent of the average diameter and less than about 160 percent of the average diameter.

8. (Twice Amended) A battery comprising an anode, a cathode comprising vanadium oxide particles having an average diameter from about 5 nm to about [500] 1000 nm and a binder, and a separator element disposed between the anode and the cathode, wherein the collection of vanadium oxide particles has a distribution in sizes such that at least about 95 percent of the particles have a diameter greater than about 40 percent of the average diameter and less than about 160 percent of the average diameter.

15. (Twice Amended) A battery comprising an anode, an electrolyte, a cathode and a separator element disposed between the anode and the cathode, the electrolyte comprising lithium ions and the cathode comprising nanoparticles of electroactive material that intercalates lithium ions and a binder, [wherein the nanoparticles of electroactive material in the cathode have an average diameter from about 5 nm to about 500 nm and] wherein the electroactive material in the cathode exhibits an

energy density greater than about 900 Wh/kg during discharge of the battery when discharged from 4 volts to 1.8 volts at 25°C.

20. (Amended) A method of forming a battery, the method comprising incorporating a collection of vanadium oxide particles having an average diameter from about 5 nm to about [500] 1000 nm into a cathode structure, wherein the collection of vanadium oxide particles has a distribution in sizes such that at least about 95 percent of the particles have a diameter greater than about 40 percent of the average diameter and less than about 160 percent of the average diameter.

Please add new claims 30-52 as follows:

--30. (New) The cathode composition of claim 1 wherein the collection of vanadium oxide particles has an average particle size of no more than about 500 nm.

31. (New) The cathode composition of claim 1 wherein the collection of vanadium oxide particles has an average particle size of no more than about 400 nm.

32. (New) The cathode composition of claim 1 wherein the collection of vanadium oxide particles has an average particle size of no more than about 300 nm.

33. (New) The cathode composition of claim 1 wherein the collection of vanadium oxide particles has an average particle size of no more than about 200 nm.

34. (New) The battery of claim 8 wherein the collection of vanadium oxide particles has an average particle size of no more than about 500 nm.

35. (New) The battery of claim 8 wherein the collection of vanadium oxide particles has an average particle size of no more than about 400 nm.

36. (New) The battery of claim 8 wherein the collection of vanadium oxide particles has an average particle size of no more than about 300 nm.

37. (New) The battery of claim 8 wherein the collection of vanadium oxide particles has an average particle size of no more than about 200 nm.

38. (New) The battery of claim 15 wherein the collection of vanadium oxide particles has an average particle size of no more than about 500 nm.

39. (New) The battery of claim 15 wherein the collection of vanadium oxide particles has an average particle size of no more than about 400 nm.

40. (New) The battery of claim 15 wherein the collection of vanadium oxide particles has an average particle size of no more than about 300 nm.

41. (New) The battery of claim 15 wherein the collection of vanadium oxide particles has an average particle size of no more than about 200 nm.

42. (New) The battery of claim 15 wherein the collection of vanadium oxide particles has a distribution in sizes such that at least about 95 percent of the particles have a diameter greater than about 40 percent of the average diameter and less than about 160 percent of the average diameter.

43. (New) The method of claim 20 wherein the collection of vanadium oxide particles has an average particle size of no more than about 500 nm.

44. (New) The method of claim 20 wherein the collection of vanadium oxide particles has an average particle size of no more than about 400 nm.

45. (New) The method of claim 20 wherein the collection of vanadium oxide particles has an average particle size of no more than about 300 nm.

46. (New) The method of claim 20 wherein the collection of vanadium oxide particles has an average particle size of no more than about 200 nm.

47. (New) A cathode composition comprising vanadium oxide particles having an average diameter from about 5 nm to about 500 nm and a binder.

48. (New) The cathode composition of claim 47 wherein the collection of vanadium oxide particles has an average particle size of no more than about 400 nm.

49. (New) The cathode composition of claim 47 wherein the collection of vanadium oxide particles has an average particle size of no more than about 300 nm.

50. (New) The cathode composition of claim 47 wherein the collection of vanadium oxide particles has an average particle size of no more than about 200 nm.

51. (New) The cathode composition of claim 47 further comprising supplementary electrically conductive particles.

52. (New) The cathode composition of claim 47 wherein the binder comprises polyvinylidene fluoride, polyethylene oxide, polyethylene, polypropylene, polytetrafluoroethylene, polyacrylates or mixtures or copolymers thereof.--